

REMARKS

Claims 4-6 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Claims 4-6 have been amended as kindly suggested by the Examiner. As such, Applicant respectfully requests withdrawal of the rejections under 35 U.S.C. § 112.

Claims 1-6 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over WO 93/12877 in view of U.S. Patent No. 5,352,264 to Medina Vega ("Vega") and U.S. Patent No. 5,830,887 to Kelly ("Kelly"). Preliminarily, Applicant notes that the primary reference (WO 93/12877) was cited in the PCT International Search Report of the priority document, International Application No. PCT/IN00/00015, and cited in Applicant's information disclosure statement, filed November 27, 2001 in connection with the instant application.

The International Preliminary Examining Authority, in its International Preliminary Examination Report ("the Report") that issued May 28, 2001 (copy enclosed), acknowledged the novelty, inventiveness, and the industrial applicability of the present invention in view of WO 93/12877 (*i.e.*, document D2). In fact, the Report specifically commented that the raw materials disclosed in WO 93/12877 are "totally different" from the materials recited in the instant claims, and the claimed agropolymers "comprise pentosans as the major constituent which is not the case with the products obtained in [WO 93/12877]." These findings directly contradict the Examiner's assertion

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that the "[c]laims differ mainly from the WO patent in that the specific crops and plant parts therefrom, are not disclosed and specific treatments for manipulating the crop plant parts are not disclosed." (Office Action at page 3).

Moreover, the Examiner admits that none of the three cited references teaches the claimed invention. Nevertheless, the Examiner asserts that the claimed invention is obvious - a conclusion premised upon the contention that it would have been obvious to one of ordinary skill in the art to combine the teachings to reach the claimed invention. Applicant respectfully disagrees.

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WO 93/12877 relates to a crosslinked highly porous body having an open-celled three-dimensional lattice structure which is used as insulating material, fibers, absorbents, adsorbents, and ion exchange resins. WO 93/12877 teaches both synthetic and natural polymers as the base material for preparing the crosslinked highly porous body. Notably, the polymers employed by WO 93/12877 are essentially gel-forming materials such as proteins. In direct contrast, the raw materials required by the present invention are incapable of forming gels and, therefore, are entirely different. In addition, as specifically recited in independent Claim 1, the matrix of the claimed agropolymers are substantially devoid of proteins.

The product taught by WO 93/12877, and articles formed therefrom, possess relatively low density and exhibit beneficial strength characteristics designed for a desired utility such as support. Such product qualities are not consistent with the

claimed agropolymers, and therefore, teach away from the present invention.

The porous body of the material taught by WO 93/12877 is crosslinked with crosslinking agents such as diisocyanates, diacid halides, diepoxides, epichlorohydrin, aldehydes, dialdehydes, trimetaphosphates, vinyl sulfones, urea-formaldehydes, and di-halogenated aliphatics. It is commonly known in the art that humic acid and tannic acid are crosslinked to enhance metal binding property. In direct contrast, the instant specification teaches a novel metal-binding agropolymer that is devoid of any crosslinking agents of a metal-binding organic nature such as tannic or humic acids.

The Examiner cites to page 45 of WO 93/12877, which discloses polymers derived from natural products, to suggest that such teaching would motivate the skilled artisan to use the natural crop plant sources of Vega and Kelly in the polymers taught by WO 93/12877. Example 11 of WO 93/12877 indicates that different naturally derived hydrogels (*i.e.*, Chitosan, sodium alginate, agar, carrageenan, locust bean gum, guar gum, gum arabic, gum ghatti, pectin, tragacanth, and janthangum) were tested for their ability to form low-density crosslinked materials. However, Example 11 clearly demonstrates that the use of the disclosed plant-based raw materials (*i.e.*, agar, carrageenan, locust bean gum, guar gum, gum arabic, gum ghatti, pectin, tragacanth, and janthangum) failed to yield the desired result. For example, “[d]issolving Gums Arabic, Ghatti, Tragacanth and Xanthan in distilled water resulted in the formation of viscous solutions, but no good

gelling procedure was found for any of them." (WO 93/12877 at page 45, lines 30-33).

Also, "[t]he pectin gel that resulted was not sufficiently strong to be useful." (WO 93/12877 at page 46, lines 2-4). Further, agar, carrageenan, locust bean and guar gum were found not suitable as they collapsed (WO 93/12877 at page 46, lines 24-29). Indeed, only sodium alginate, a sodium salt of 1-4 linked polymannuronic acid, and chitosan obtained from shrimp shells were suitable for preparing the low-density crosslinked material.

Therefore, in light of the teachings of WO 93/12877, a person skilled in the art would **not** be motivated to use any plant-based material because all tested plant-based materials, namely agar, carrageenan, locust bean gum, guar gum, gum arabic, gum ghatti, pectin, tragacanth, and janthangum, were found unsuitable for preparing the low-density crosslinked material.

Additionally, the instant specification teaches an agropolymer that preferably is in malleable, powder form. Thus, the claimed agropolymer can be compressed to form bricks, other such suitable structure, or developed as a layered structure. Polluted water can be simply passed through the agropolymer of the invention, which then binds any metal in the water, thereby resulting in water free of metal pollutants. Alternatively, an article of manufacture comprising the claimed agropolymer can be floated on the polluted water to render the water substantially free of pollutants. Such compositions comprising the claimed agropolymer are not taught or suggested by

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WO 93/12877.

The agropolymer of the present invention is chemically distinct when compared to other porous bodies which are linked to metals to remove ions rather than crosslinking with other metal binding agents. The instantly claimed agropolymer can be used repeatedly in column mode or batch mode, and is relatively inexpensive to prepare. WO 93/12377 teaches no such properties in its polymeric materials. Further, Applicant submits that, since the porous body of the WO 93/12377 polymeric material is crosslinked with other metal binding agents (which is not a limitation of the instantly claimed agropolymer), there is no apparent motivation to modify the reference to reach the instantly claimed agropolymer.

Also, the method for the manufacture of the agropolymer of the present invention is entirely different from that of WO 93/12377. According to the WO 93/12877, chitosan body is dissolved in a gelling solvent, to form a chitosan solution, which is freeze-dried. Crosslinking solvent is then added to the freeze-dried gel followed by addition of crosslinking agent to obtain a porous chitosan body. On the other hand, the present invention teaches that plant materials (*e.g.*, seed coats, hulls, husks, etc. of crops) be pulverized, and treated with an alkali or acidic solution to obtain resultant agropolymer. Thus, because the method taught by WO 93/12877 is entirely different from that of the instant specification, any motivation to modify the reference to reach the claimed invention is again absent.

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Thus, Applicant respectfully submits that WO 93/12877 does not teach or suggest the present invention, and at least for the above-mentioned reasons, the instantly claimed agropolymer cannot be obvious over WO 93/12877 alone, or in combination with the other cited references.

Vega generally relates to the field of soil conditioners and plant growth regulators which act as fruit-filling enhancers and growth regulators. Vega particularly relates to a composition which essentially contains polyhydroxycarboxylic acids, carbohydrates, and alcohols which may be obtained from rice and oat hulls. Vega teaches that the aforesaid mixture can act as metal complexing agent. The mixture consisting of polyhydroxycarboxylic acids, carbohydrates, and alcohols is treated with metals to form metal complexes, and the complexes thus obtained are used as soil conditioning agents, plant growth biostimulants, and fertilizer additives.

The present invention, on the other hand, relates to a composition that is useful for removing heavy metals and other contaminants from water. Thus, the objective of each the invention is different so that a person skilled in the art concerning the present invention would not refer to Vega, much less have motivation to combine Vega with the primary reference, WO 93/12877.

On page 4, lines 6 and 8 of the Office Action, the Examiner states that “Vega teaches that the carbohydrates of the crop plant parts provide for metal binding reactive sites, since carbohydrates are disclosed to be useful as a metal complexing

refer to Kelly to reach the present invention, much less find motivation to combine Kelly with the primary reference, WO 93/12877.

As discussed in detail above, each of the cited references is directed to entirely different fields. None of the references teach or suggest that carbohydrate and/or silica matrix obtained from seed coats, seed covers, hulls and husks of crops could, or should, be combined together into a single composition to obtain the claimed agropolymer.

Three basic criteria must be met in order to establish a *prima facie* case of obviousness. First, there must be a suggestion or motivation to modify the references or combine the reference teachings. The fact that references *can* be combined does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); *see also* M.P.E.P. § 2143. Second, there must be a reasonable expectation of success. *In re Merck*, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, all claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Only if all three of these requirements are demonstrated has a *prima facie* case of obviousness been established.

2 The Office Action fails to demonstrate that the cited references provide the required motivation or suggestion, and the reasoning offered to combine the primary and secondary references improperly relies on hindsight. A statement that, because the cited

references together teach all aspects of the claimed invention, modification of the prior art to meet the claimed invention would have been *prima facie* obvious to one of ordinary skill in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. The mere fact that references can be combined does not render the proposed combination obvious. In the present case, there is no reason why one of ordinary skill in the art would have been motivated to combine the cited references, especially in view of the fact that the primary reference (*i.e.*, WO 93/12877) teaches that plant-based materials are not suitable for forming the crosslinked highly porous body of their invention.

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Similarly, given the reported failure in WO 93/12877 when using plant-based materials, the required reasonable expectation of success appears to be lacking in the proposed combination of references. Indeed, in light of the teachings of the cited references, one of ordinary skill in the art would not have expected that the asserted combination would be a useful agropolymer, as instantly claimed.

Finally, Applicant respectfully submits that selection and combination of certain steps from the cited references, using hindsight reconstruction of the present invention, nevertheless would not suffice to create the claimed composition. The process for preparing the claimed agropolymer has evolved through systematic steps, and only after much experimentation, has succeeded in arriving at a composition with the claimed properties. Thus even if provided the missing motivation, the skilled artisan, when

drawing from the cited references which are directed to disparate inventions, likely would not have succeeded in developing the claimed invention.

Thus, Applicant respectfully submits that, when taken as a whole, the cited references do not provide the motivation or reasonable expectation of success to arrive at the claimed agropolymer. Accordingly, withdrawal of the rejection of Claims 1-6 under 35 U.S.C. § 103(a) is respectfully requested.

Conclusion

Applicant respectfully requests reconsideration of the application, and entry of the foregoing remarks into the file history of the above-identified application. Applicant believes that in light of the foregoing remarks, the claims are in condition for allowance, and accordingly, respectfully requests withdrawal of the outstanding rejection. An allowance is earnestly sought.

Respectfully submitted,



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agent". To support this statement, the Examiner relies upon col. 1, lines 45-50 of Vega.

In this regard, the Applicant respectfully submits that Vega does not teach that carbohydrates can act as metal complexing agents. Instead, Vega only teaches that a mixture of polyhydroxycarboxylic acids, carbohydrates and alcohols can act as a metal complexing agent. All three ingredients of the mixture taught Vega are not required in the instantly claimed agropolymer, thereby supporting Applicant's position that Vega lacks any teaching or suggestion to combine the prior art to reach the claimed invention.

Further, the process for preparing the instantly claimed agropolymer is completely different from the process taught by Vega. Since the starting material of Vega has been processed differently from that of the present invention, the products ultimately obtained are different, and also their applications are different, which again indicates that Vega does not teach or suggest the present invention, and the instantly claimed agropolymer cannot be obvious over Vega alone, or in combination with the other cited references.

Kelly describes a composition comprising of natural phyto-oestrogens or analogues thereof, which are used as food additives or for promoting health in cancer cases, pre-menstrual syndrome, menopause, and hypercholesterolaemia. The present invention, on the other hand, relates to a composition which is useful for removing heavy metals and other contaminants from water. Thus, when compared to the present invention, the objectives are entirely different. As such, the skilled artisan would not